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(54) **Packing assembly for high pressure reciprocating plunger pump.**

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Description

This invention relates to a packing assembly for sealing an annular space between a pump plunger and a pump body of a reciprocating plunger pump, such pumps being utilized, for example, for pumping cement slurries, fracturing slurries, acids and the like for the completion and stimulation of wells in the oil and gas industry.

During the completion and/or stimulation of an oil or gas well, fluids such as cement slurries, fracturing slurries, acids and the like are pumped under pressure into the well. Very high pressures of the order of many thousands of pounds per square inch (1 psi is equivalent to 6.89 kPa) are typically involved in these pumping operations. Additionally, the fluids are often very abrasive because they carry large quantities of solid particles therein. This pumping operation is typically achieved by large positive displacement reciprocating plunger-type pumps.

A very difficult sealing problem is encountered at the high pressure end of these pumps, where the abrasive fluid must be prevented from leaking between the reciprocating plunger and the cylinder within which it reciprocates. Typically, the seal between the reciprocating plunger and the cylinder comprises a packing arrangement including a plurality of V-shaped packing rings constructed of cloth and binder, with various male and female adapters at the forward and rearward ends of those packing sets. A longitudinal compression is applied to the packing set by an adjusting ring.

Packing arrangements incorporating such V-shaped packing rings are well known. Typical examples are shown in U.S. Patents Nos. 3120394, 3419280. 3834715, 4283062 and British Patent specifications Nos. 1068721 and 1131830.

Among the problems encountered in the use of such packings is the deterioration of the V-shaped cloth and binder packing rings due to the hydraulic load from the high pressure fluid end of the pump. A second problem typically encountered is extrusion of the V-shaped cloth and binder packing rings between the small annular clearances provided between a female adapter supporting the rearward end of the packing rings and the pump plunger and pump cylinder.

We have now devised a packing assembly for a reciprocating plunger pump, by which many of the prior art problems are reduced or overcome.

The packing assembly for sealing an annular space between a pump plunger and a pump body of a reciprocating plunger pump is of the type comprising: header ring means disposed in a high pressure end of said annular space behind said header ring means, said packing ring means including at least one V-shaped packing ring with a concave side of said packing ring facing said header ring means; and a female adapter ring disposed in said annular space behind a last V-shaped packing ring of said packing ring means.

The invention is characterised in that the header ring means is radially compressed and of elastomeric, preferably homogeneous elastomeric, material for preventing migration of fluid through said annular space; and in that a V-shaped anti-extrusion ring means is disposed in said annular space between said last V-shaped packing ring and said female adapter for preventing extrusion of said last V-shaped packing ring between said female adapter and each of said pump plunger and said pump body, said anti-extrusion ring means being of material harder than that of said packing rings and including a concave side engaging said last V-shaped packing ring; a convex side engaging a forward concave side of said female adapter; and radially inner and outer sealing surfaces for engaging said pump plunger and said pump body, respectively.

The particular arrangement of the present invention has been found to provide operating lifetimes of substantially in excess of the lifetimes experienced with typical prior art packings.

In order that the invention may be more fully understood, an embodiment thereof will now be described by way of example only, with reference to the accompanying drawings, wherein:

Figure 1 is a schematic sectioned elevational view of a reciprocating plunger type pump having a packing assembly of the present invention in place therein;

Figure 2 is a cross-section view of the header ring of the packing assembly of Figure 1; and

Figure 3 is a cross-section view of the header ring, the packing ring means, and the anti-extrusion ring of Figure 1, all affixed together in a packing set prior to placement thereof in the annular space of the reciprocating plunger pump.

Referring now to the drawings and particularly to Figure 1, the packing assembly of the present invention is shown and generally designated by the numeral 10. The packing assembly 10 is shown in place within an annular space 12 defined between a radially outer surface 14 of a pump plunger 16 and a cylindrical bore 18 of a pump body 20.

The plunger 16 reciprocates within the pump body 20 to pump a fluid located in a high pressure end 22 of the pump 24 through a series of inlet and outlet valves (not shown) in a manner which is generally known to those skilled in the art. The pump 24 can be any reciprocating plunger pump and particularly may be a reciprocating plunger pump for pumping cement slurries fracturing slurries, acids and the like for completion and stimulation of an oil or gas well.

The packing assembly 10 includes an elastomeric header ring means 26. The header ring means is disposed in a high pressure end of the annular space 12 which is the end adjacent the high pressure end 22 of pump 24.

Header ring means 26 provides a primary seal of annular space 12 due to radial compression of header ring means 26. This primary seal provides a means for preventing migration of fluid from the pressure end 22 of pump 24 through the annular space 12.

Prior to placement in the annular space 12, the

header ring means 26 has an uncompressed cross-sectional shape as shown in Figures 2 and 3.

Header ring means 26 includes a forward facing flat annular surface 28, and a radially outer cylindrical surface 30. A rearward end of header ring means 26 is rearwardly tapered as at 32 and 34 and includes a bead 36 on the rearward end thereof. A radially inner surface 38 of header ring means 26 is partially circular in cross-section and is constructed to be engaged by the pump plunger 16 upon assembly of the pump 24 so that the cross-section header ring means 26 is radially compressed within the annular space 12 between the pump plunger 16 and the pump body 20.

The header ring means 26 is solid in cross-section, i.e. there are no voids in the cross-section to be closed up upon radial compression, but rather the radial compression occurs across a solid portion of the header ring means 26.

The header ring means 26 is preferably constructed of a homogeneous elastomeric material. By the term "homogeneous" it is meant that the elastomeric material from which the header ring 38 is constructed does not include any nonhomogeneous materials, such as layers of cloth or other reinforcing materials therein. Nonhomogeneous elastomeric materials could, however, be used for the header ring means 26. Also, a reinforcing fabric (not shown) may be used on the rearward surfaces 32, 34, 36 of header ring means 26.

Preferably the header ring means 26 is constructed from nitril butadiene rubber having a hardness of seventy to eighty durometer.

The packing assembly 10 further includes a packing ring means 40 disposed in the annular space 10 behind the header ring means 26.

Packing ring means 40 is shown as including first and second V-shaped packing rings 42 and 44. Packing ring means 40 must include at least one V-shaped packing ring, and may include more than two such rings.

The first V-shaped packing ring 42 has a concave side 46 adjacent, facing and engaging the rearward end 32, 34 of header ring means 26. The bead 36 of header ring means 26 is closely received within a D-shaped groove 48 in the concave side 46 of packing ring 42, to anchor the packing ring 42 to the header ring means 26.

The packing rings 42 and 44 are conventional cloth and binder type packing rings.

A female adapter ring 50, preferably constructed from brass, is disposed in the annular space 12 behind the last V-shaped packing ring 44 of packing ring means 40.

A V-shaped anti-extrusion ring means 52 is disposed in annular space 12 between the last V-shaped packing ring 44 and the female adapter 50.

Anti-extrusion ring means 52 provides a means for preventing extrusion of the last V-shaped packing ring 44 between the female adapter 50 and each of the pump plunger 16 and the cylindrical bore 18 of pump body 20.

The anti-extrusion means 52 includes a concave side 54 facing, adjacent and engaging a rear side of the last V-shaped packing ring 44.

Anti-extrusion ring means 52 also includes a convex rear side 56 facing, adjacent and engaging a forward concave side 58 of female adapter 50.

Anti-extrusion ring means 52 also includes radially inner and outer sealing surfaces 60 and 62 engaging pump plunger 16 and cylindrical bore 18 of pump body 20, respectively.

The V-shaped anti-extrusion ring means 52 is so arranged and constructed that it is sufficiently flexible that the inner and outer sealing surfaces 60 and 62 thereof are spread apart into sealing engagement with the pump plunger 16 and the cylindrical bore 18 of pump body 20, respectively, when fluid pressure in the high pressure end 22 of pump 24 reaches a first value less than a fluid pressure required to extrude the last V-shaped packing ring 44 between the female adapter 50 and either of said pump plunger 16 or cylindrical bore 18 of pump body 20.

Such extrusion problems have typically been encountered with prior art type packings at pressures on the order of about 6,000 psi (41.3 MPa) in the high pressure end 22. Thus, the first value of pressure in the high pressure end 22 at which the anti-extrusion ring means 52 should flex to seal the clearances between female adapter ring 50 and the pump plunger 16 and pump body 20 should be at a value significantly lower than 6,000 psi, (41.3 MPa).

As is best illustrated in Figure 3, in a preferred embodiment of the invention, the header ring means 26, packing ring means 40 including the packing rings 42 and 44, and the anti-extrusion ring means 52 are all affixed together into a preassembled packing set prior to installation thereof in the annular space 12.

This affixation of header ring 26, packing rings 42 and 44, and anti-extrusion ring 52 can be achieved by means of gluing the components together.

The packing assembly 10 further includes a brass header ring adapter means 64, disposed in the annular space 12 ahead of and engaging the forward surface 28 of elastomeric header ring means 26. Header ring adapter means 64 could also be constructed of other metal or plastic materials.

The header ring adapter means 64 provides a means for longitudinally supporting the elastomeric header ring means 26 against forward extrusion thereof when pump plunger 16 reciprocates forward relative to pump body 20.

The header ring adapter means 64 has a substantially rectangular cross-section, as can be seen in Figure 1, with a radially inner surface 66 thereof spaced from pump plunger 16 to allow high pressure fluid from high pressure end 22 to contact the front side 28 of elastomeric header ring means 26.

The V-shaped anti-extrusion ring means 52 is V-shaped in cross-section as seen in Figures 1 and 3.

This cross-section is defined by a radially inner leg 68 and a radially outer leg 70. The legs 68 and 70 are joined together at their rearward ends as at 72. Each of the legs 68 and 70 has a thickness 74 as seen in cross-section substantially smaller than a cross-sectional length 78 of the leg.

The concave side 54 of anti-extrusion ring means 52 is defined by forward surfaces of the radially inner and outer legs 68 and 70.

The convex side 56 of anti-extrusion ring means 52 is defined by rearward surfaces of the radially inner and outer legs 68 and 70.

The radially inner sealing surface 60 of anti-extrusion ring means 52 is defined on a forward end of the radially inner leg 68.

The radially outer sealing surface 62 of anti-extrusion ring means 52 is defined on a forward end of the radially outer leg 70.

Preferably, the anti-extrusion ring means 52 is a bronze stamping which is stamped from a sheet of bronze. After stamping, the anti-extrusion ring means 52 should be fully annealed.

A thickness 74 of radially outer leg 70, as best illustrated in Figure 3, preferably has a value in the range of about 0.080 to 0.100 inches (2.03 to 2.54 mm). The included angle between the legs 68 and 70 is preferably approximately 90°.

A radial width 76, again best seen in Figure 3, of anti-extrusion ring means 52 is typically on the order of about one-half inch (12.7 mm) for a pump plunger 16 having a diameter of about 4.5 inches (11.4 cm).

Thus, a length 78 of radially outer leg 70 for this disclosed embodiment is approximately 0.35 inches (8.9 mm) which is substantially greater than the thickness 74 thereof.

The V-shaped anti-extrusion ring means 52, and particularly the embodiment just disclosed, is so constructed that a permanent set is imparted thereto when the inner and outer sealing surfaces 60 and 62 are spread apart due to the forces from high pressures in high pressure end 22 of pump 24.

The packing assembly, 10 further includes, a seal carrier means 80 disposed in the annular space 12 directly behind and engaging a rear end 82 of female adapter ring 50.

The seal carrier means 80 has a oil passage 84 disposed therethrough for conducting lubricating oil from a lubricating oil supply line 86 to the pump plunger 16 for lubricating the pump plunger 16 along the area of sealing engagement with the packing assembly 10.

Seal carrier means 80 includes inner and outer seals 94 and 96 for sealing against plunger rod 16 and cylindrical bore 18 of pump body 20, respectively.

Packing assembly 10 further includes a packing adjustment ring means 88 located behind and directly engaging a rear end 90 of seal carrier means 80.

Packing adjustment means 88 may be adjusted by rotation of the same at threaded connection 92 for advancing packing adjustment ring means 88 relative to pump body 20 and for thereby adjusting a longitudinal compression of the remaining components of packing assembly 10.

In the packing assembly 10, a high sealability against leakage of fluid from high pressure end 22 is provided by the radial compression of header ring means 26. This is the primary seal against fluid leakage.

Additional sealing against migration of fluid from the high pressure fluid end 22 is provided by the packing rings 42 and 44.

Extrusion of the last packing ring 44 past the female adapter ring 50 is prevented by anti-extrusion ring means 52.

The V-shaped rings, such as 42 and 44 and such as the anti-extrusion ring means 52, achieve their sealing effect due to being pressure energized or mechanically energized to spread the legs of the V-shaped sealing elements so as to seal the ends of those legs against the pump plunger and the pump body. That is as contrasted to the radial compression which achieves the seal on the header ring means 26.

The wearing components of the packing assembly 10 include the header ring means 26, the packing elements 42 and 44, and the anti-extrusion ring means 52 which wears on the surfaces 60 and 62.

These wearing components may be replaced when they wear out by disassembling the packing assembly 10 and replacing the header ring means 26, the packing elements 42 and 44, and anti-extrusion ring means 52 with a new packing set such as that illustrated in Figure 3.

The header ring adapter means 64 and the female adapter ring 50 may be reused and generally do not need to be replaced when the pump 24 is repacked.

This provides a significant improvement over certain prior art attempts to provide an anti-extrusion device wherein a component analogous to the female adapter 50 itself was designed to flex to prevent extrusion. In those prior art designs, the female adapter itself would wear and thus would need to be replaced when the pump was repacked.

With the packing set of the present invention having the anti-extrusion ring means 52 directly ahead of the female adapter 50 a replaceable wearing ring, namely the anti-extrusion ring means 52, is provided which may be easily and economically replaced upon repacking of the pump 24.

An additional advantage of the packing assembly 10 is that the resiliency of the solid cross-section elastomeric header ring means 26 substantially eliminates the need to periodically tighten the packing adjustment ring 88.

Experimental field test results have shown the life of the packing assembly of the present invention to be several times greater than the life of standard packing arrangements which use neither header ring means such as 26 or an anti-extrusion ring means such as 52.

Claims

1. A packing assembly (10) for sealing an annular space (12) between a pump plunger (16) and a pump body (20) of a reciprocating plunger pump (24) said assembly comprising: a header ring means (26) disposed in a high pressure end of said annular space; packing ring means (40) disposed in said annular space behind said header ring means, said packing ring means including at least one V-shaped packing ring (42, 44) with a concave side (46) of said packing ring (42) facing said header ring means; and a female adapter ring (50) disposed in said annular space behind a last V-shaped packing ring (44) of said packing ring means; characterised in that said header ring means is radially compressed and of elastomeric, preferably homogeneous elastomeric, material for preventing migration of fluid through said annular space; and in that a V-shaped anti-extrusion ring means (52) is disposed in said annular space between said last V-shaped packing ring and said female adapter for preventing extrusion of said last V-shaped packing ring between said female adapter and each of said pump plunger and said pump body, said anti-extrusion ring means being of material harder than that of said packing rings and including a concave side (54) engaging said last V-shaped packing ring; a convex side (56) engaging a forward concave side of said female adapter; and radially inner (60) and outer (62) sealing surfaces for engaging said pump plunger and said pump body, respectively.

2. An assembly according to claim 1, wherein: said V-shaped anti-extrusion ring means is flexible so that said inner and outer sealing surfaces thereof are spread apart into sealing engagement said pump plunger and said pump body, respectively, when fluid pressure in said high pressure end of said annular space reaches a first value less than a fluid pressure required to extrude said last V-shaped packing ring between said female adapter and either of said pump plunger and said pump body.

3. An assembly according to claim 1 or 2, wherein: said header ring means, said packing ring means, and said V-shaped anti-extrusion means are affixed together into a preassembled packing set prior to installation thereof in said annular space.

4. An assembly according to claim 1, 2 or 3, further comprising: a header ring adapter means (64) disposed in said annular space ahead of and engaging said elastomeric header ring means, for longitudinally supporting said elastomeric header ring means against forward extrusion thereof when said pump plunger reciprocates forward relative to said pump body.

5. An assembly of claim 4, wherein: said header ring adapter means has a substantially rectangular, preferably solid, cross-section with a radially inner surface (66) thereof spaced from said pump plunger to allow high pressure fluid to contact a front side of said elastomeric header ring means.

6. An assembly according to any of claim 1 to 5, wherein: said V-shaped anti-extrusion ring means has a cross-section defined by a radially inner leg (68) and a radially outer leg (70) joined together at their rearward ends, each of said legs having a cross-sectional thickness substantially smaller than a cross-sectional length thereof; said radially inner (60) and outer (62) sealing surfaces of said V-shaped anti-extrusion ring means being defined on forward ends of said radially inner leg and said radially outer leg respectively; said V-shaped anti-extrusion ring means preferably being a bronze stamping.

7. An assembly according to claim 6, wherein said V-shaped anti-extrusion ring means is so constructed that a permanent set is imparted thereto when said inner and outer sealing surfaces are spread apart.

8. An assembly according to any preceding claim, wherein: said elastomeric header ring has a solid cross-section, and is so arranged and constructed that it seals said annular space due primarily to radial compression of said elastomeric header ring means between said pump plunger and said pump body.

9. An assembly according to any preceding claim, further comprising: a seal carrier means (80), disposed in said annular space directly behind said female adapter ring, said seal carrier means having an oil passage (84) disposed therethrough for conducting lubricating oil to said pump plunger.

10. An assembly according to claim 9, further comprising: a packing adjustment ring means (88), located behind and directly engaging said seal carrier means, for adjusting a longitudinal compression of said elastomeric header ring means, said packing ring means, and said V-shaped anti-extrusion ring means.

Patentansprüche

1. Packungsanordnung (10) zum Abdichten eines Ringraums (12) zwischen einem Pumpenkolben (16) und einem Pumpenkörper (20) einer Tauchkolbenpumpe (24), enthaltend: Kopfringmittel (26) im Hochdruckende des Ringraums: Packungsringmittel (40) im Ringraum hinter den Kopfringmitteln und mit wenigstens einem V-förmigen Packungsring (42, 44), der den Kopfringmitteln mit einer Konkavseite (46) gegenüberliegt; und einen zurückspringenden Adapterring (50) im Ringraum hinter einem letzten V-förmigen Packungsring (44) der Packungsmittel; dadurch gekennzeichnet, daß die Kopfringmittel radial zusammengedrückt sind und aus einem elastomeren, vorzugsweise homogen elastomeren Material besteht, das eine Fluidwanderung durch den Ringraum verhindert; und daß in dem Ringraum zwischen dem letzten V-förmigen Packungsring und dem zurückspringenden Adapter V-förmige Anti-Extrusionsringmittel (52) angeordnet sind, die eine Extrusion des letzten V-förmigen Packungsrings zwischen dem zurückspringenden Adapter und jeweils dem Pumpenkolben und

dem Pumpenkörper verhindern und aus einem härteren Material als die Packungsringe bestehen und eine Konkavseite (54) enthalten, die dem letzten V-förmigen Packungsring anliegt, eine Konvexseite (56), die einer vorderen Konkavseite des zurückspringenden Adapters anliegt, und radial innere (60) und äußere Dichtflächen zur Anlage an dem Pumpenkolben bzw. dem Pumpenkörper.

2. Anordnung nach Anspruch 1, dadurch gekennzeichnet, daß die V-förmigen Anti-Extrusionsringmittel flexibel sind, so daß ihre inneren und äußeren Dichtflächen in abdichtende Anlage an den Pumpenkolben bzw. den Pumpenkörper auseinandergespreizt sind, wenn der Fluiddruck im Hochdruckende des Ringraums einen ersten Wert erreicht, der geringer ist als der erforderliche Fluiddruck zum Extrudieren des letzten V-förmigen Packungsrings zwischen dem zurückspringenden Adapter und jeweils dem Pumpenkolben und dem Pumpenkörper.

3. Anordnung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß die Kopfringmittel, die Packungsringmittel und die V-förmigen Extrusionsringmittel dem Einbau in dem Ringraum zu einem vormontierten Packungssatz zusammengefügt werden.

4. Anordnung nach einem der Ansprüche 1, 2 oder 3, gekennzeichnet durch: Kopfring-Adaptermittel (64), die im Ringraum vor und in Anlage an den elastomeren Kopfringmitteln angeordnet sind und die elastomeren Kopfringmittel gegen vorwärts gerichtete Extrusion in Längsrichtung abstützen, wenn sich der Pumpenkolben relativ zu dem Pumpenkörper nach vorn bewegt.

5. Anordnung nach Anspruch 4, dadurch gekennzeichnet, daß die Kopfring-Adaptermittel einen im wesentlichen rechteckigen, vorzugsweise vollen Querschnitt mit einer radialen Innenfläche (66) aufweisen, die im Abstand vom Pumpenkolben angeordnet ist und erlaubt, daß Hochdruckfluid mit einer Vorderseite der elastomeren Kopfringmittel in Berührung kommt.

6. Anordnung nach einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß die V-förmigen Anti-Extrusionsringmittel einen Querschnitt haben, der durch einen radialen Innenschenkel (68) und einen radialen Außenschenkel (70) bestimmt ist, die an ihren rückwärtigen Enden miteinander verbunden sind und deren Dicke im Querschnitt wesentlich geringer ist als ihre Länge im Querschnitt, die radial inneren (60) und äußeren (62) Dichtflächen der V-förmigen Anti-Extrusionsringmittel an Vorderenden des radialen Innenschenkels bzw. des radialen Außenschenkels bestimmt sind, und die V-förmigen Anti Extrusionsringmittel vorzugsweise ein Preßteil aus Bronze bilden.

7. Anordnung nach Anspruch 6, dadurch gekennzeichnet, daß die V-förmigen Anti-Extrusionsringmittel so ausgebildet sind, daß diese eine bleibende Einstellung erhalten, wenn die inneren und äußeren Dichtflächen auseinandergespreizt werden.

8. Anordnung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die elastomeren Kopfringmittel einen vollen Querschnitt haben und so angeordnet und ausgebildet sind, daß sie den Ringraum in erster Linie durch radiale Kompression der elastomeren Kopfringmittel zwischen dem Pumpenkolben und dem Pumpenkörper abdichten.

9. Anordnung nach einem der vorstehenden Ansprüche, gekennzeichnet durch, Dichtungsträgermittel (80) im Ringraum unmittelbar hinter dem zurückspringenden Adapterring und mit einem Ölkanal (84), der sich durch die Dichtungsträgermittel erstreckt, um dem Pumpenkolben Schmieröl zuzuleiten.

10. Anordnung nach Anspruch 9, gekennzeichnet durch: Packungs-Einstellringmittel (88), die sich hinter und in direkter Anlage an den Dichtungsträgermitteln befinden, zur Einstellung der Längskompression der elastomeren Kopfringmittel, Packungsringmittel und V-förmigen Anti-Extrusionsringmitteln.

Revendications

1. Ensemble (10) de garniture pour assurer l'étanchéité d'un espace annulaire (12) entre un piston (16) de pompe et un corps de pompe (20) d'une pompe (24) à piston plongeur, ledit ensemble comprenant: une bague de tête (26) disposée dans une extrémité haute pression dudit espace annulaire; un dispositif (40) de bagues de garniture, disposé dans ledit espace annulaire en arrière de ladite bague de tête, ce dispositif de bagues de garniture comprenant au moins une bague de garniture (42, 44) en forme de V avec une face concave (46) de ladite bague de garniture (42) faisant face à ladite bague de tête; et un adapteur annulaire femelle (50) disposé dans ledit espace annulaire en arrière d'une dernière bague de garniture (44) en forme de V dudit dispositif de bagues de garniture; caractérisée en ce que ladite bague de tête, est comprimée radialement, est en une matière élastomère de préférence homogènes pour empêcher une migration de fluide à travers ledit espace annulaire; et en ce qu'une bague anti-extrusion (52) en forme de V est disposée dans ledit espace annulaire entre ladite dernière bague de garniture en foeme de V et ledit adapteur femelle pour empêcher une extrusion de ladite dernière bague de garniture en forme de V entre ledit adapteur femelle et chacun desdits pistons de la pompe et ledit corps de pompe, ladite bague anti-extrusion étant en une matière plus dure que celle desdites bagues de garniture et comportant une face concave (54) en contact avec ladite dernière bague de garniture en forme de V; une face convexe (56) en contact avec une face avant concave dudit adapteur femelle; et des surfaces d'étanchéité radialement interne (60) et externe (62) pour être en contact respectivement avec ledit piston de la pompe et ledit corps de la pompe.

2. Ensemble suivant la revendication 1, dans lequel: ladite bague anti-extrusion en forme de V est souple de façon que lesdites surfaces d'étan-

chéité interne et externe de celle-ci soient étalées en s'écartant en contact d'étanchéité respectivement avec ledit piston de la pompe et ledit corps de pompe, lorsque la pression de fluide dans ladite extrémité haute pression dudit espace annulaire atteint une première valeur inférieure à une pression de fluide nécessaire pour extruder ladite dernière bague de garniture en forme de V entre ledit adapteur femelle et l'un ou l'autre dudit piston et dudit corps de pompe.

3. Ensemble suivant la revendication 1 ou 2, dans lequel: ladite bague de tête, le dispositif de bagues de garniture et ladite bague anti-extrusion en forme de V sont fixés ensemble en un jeu de garniture préalablement assemblé avant la pose de ce jeu dans ledit espace annulaire.

4. Ensemble suivant la revendication 1, 2 ou 3, comprenant, en outre, un adapteur annulaire de tête (64) disposée dans ledit espace annulaire en avant de ladite bague de tête en élastomère et en contact avec celle-ci, pour soutenir longitudinalement ladite bague de tête en élastomère contre une extension de celle-ci vers l'avant lorsque ledit piston de la pompe se déplace en translation vers l'avant par rapport audit corps de pompe.

5. Ensemble suivant la revendication 4 dans lequel: ledit adapteur annulaire de tête présente une section transversale à peu près rectangulair, de préférence massive, avec une surface radialement interne (66) de celui-ci espacée dudit piston de la pompe pour permettre à un fluide sous haute pression d'entrer en contact avec une face avant de ladite bague de tête en élastomère.

6. Ensemble suivant l'une quelconque des revendications 1 à 5, dans lequel: ladite bague anti-extrusion en forme de V présente une section transversale délimitée par une branche radialement interne (68) et une branche radialement externe (70) réunies ensemble à leurs extrémités arrières, chacune desdites branches ayant en section une épaisseur notablement plus faible que la longueur de cette branche considérée en section; lesdites surfaces d'étanchéité radialement interne (60) et externe (62) de ladite bague anti-extrusion en forme de V étant délimitées par extrémités avant de ladite branche radialement interne et de ladite branche radialement externe, respectivement; ladite bague anti-extrusion en forme de V étant de préférence estampée en bronze.

7. Ensemble suivant la revendication 6, dans lequel: ladite bague anti-extrusion en forme de V est réalisée de façon à lui imprimer une déformation permanente lorsque lesdites surfaces d'étanchéité interne et externe sont étendues en s'éloignant.

8. Ensemble suivant l'une quelconque des revendications précédentes dans lequel: ladite bague de tête en élastomère présente une section transversale massive, et est agencée et réalisée de façon à fermer ledit espace annulaire principalement en raison d'une compression radiale de ladite bague de tête en élastomère entre ledit piston de la pompe et ledit corps de celle-ci.

9. Ensemble suivant l'une quelconque des revendications précédentes comprenant en outre: un porte-joints (80) disposé dans ledit espace annulaire directement en arrière dudit adapteur annulaire femelle, ledit porte-joints ayant un passage (84) pour de l'huile qui le traverse, pour conduire de l'huile de lubrification audit piston de la pompe.

10. Ensemble suivant la revendication 9, comprenant en outre: un dispositif annulaire (88) de réglage de garniture, disposé en arrière dudit porte-joints et directement en contact avec celui-ci, pour régler une compression longitudinale de ladite bague de tête en élastomère dudit dispositif de bagues de garniture, et de ladite bague anti-extrusion de forme en V.

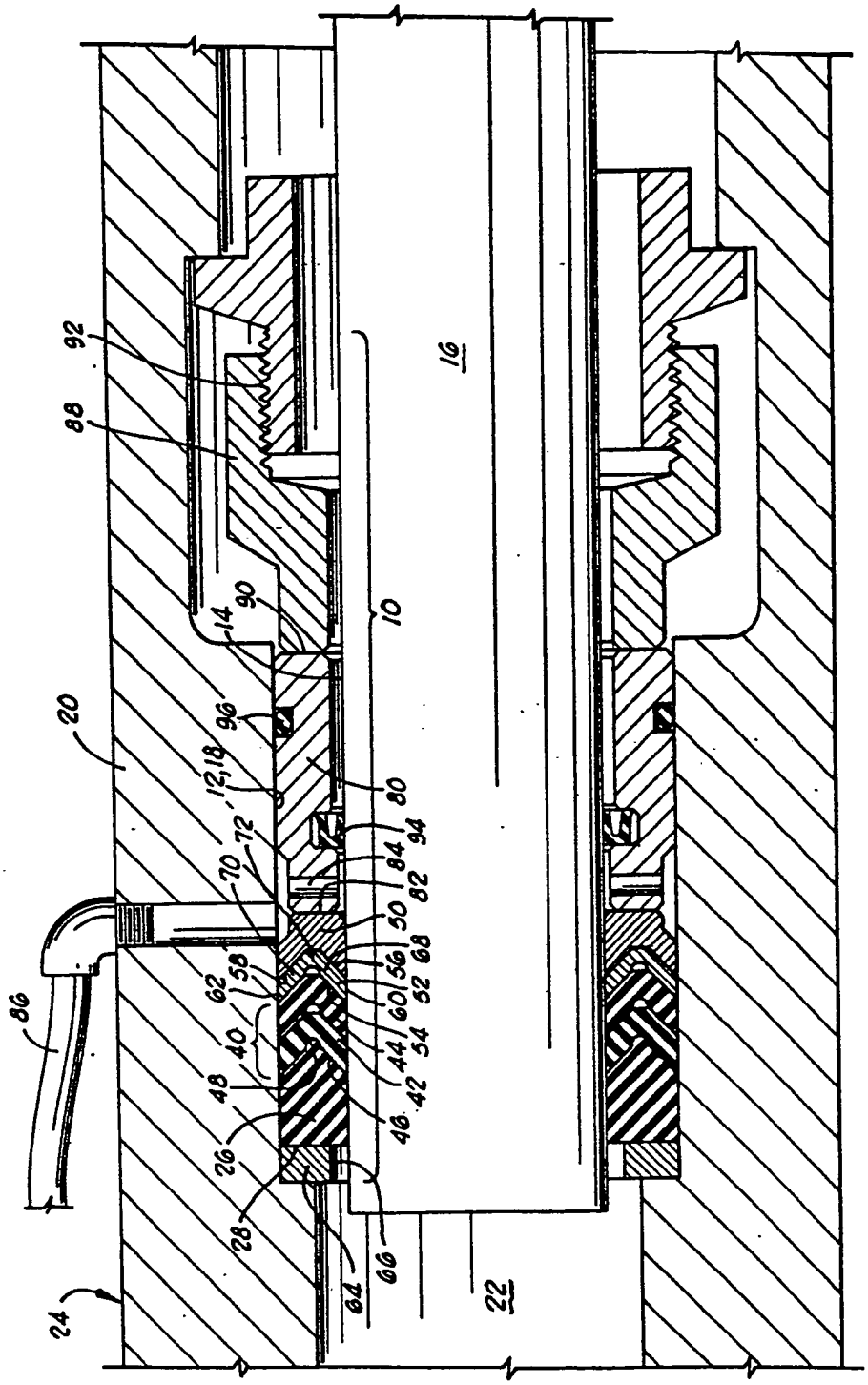

Fig. 1

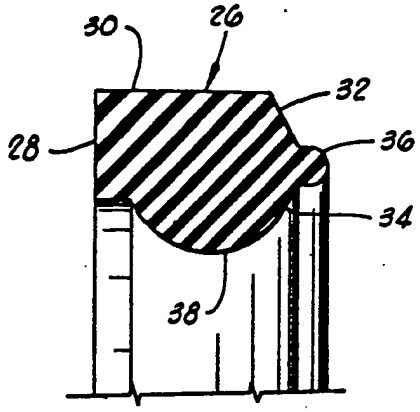

FIG. 2

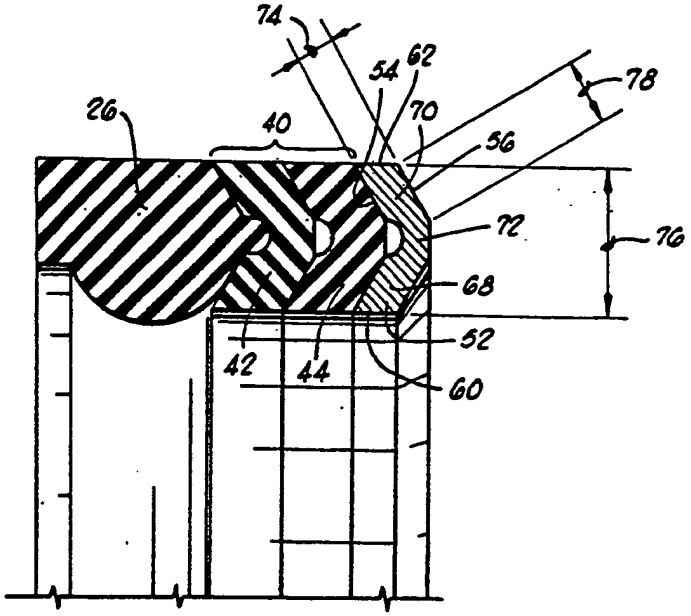

FIG. 3